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ABSTRACT

In compressed speech listening tests, performance was not significantly affected by listening aids presented during training. The aids consisted of a summary of the material to be heard and a list of key words in the material to be heard; the summary was presented to one group and the list of key words to another group. A third group did not receive a listening aid. All groups improved with practice in their ability to listen to compressed speech at 375 wpm, achieving a final mean score which averaged better than 90% of normal speed score. An examination of the data indicates that good listeners tend to be generally able and well informed, but that at higher speeds general language ability is increasingly important. The evidence also suggests that good performance at higher speed is associated with listening for meaning rather than concentration on specific words and details. The failure of the listening aids to improve performance may be attributable to their focusing attention on aspects of the passage which were irrelevant to the test questions. Subsequent research is planned. (MF)

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Further Research on Speeded Speech as an Educational Medium - - The Use of Listening Aids

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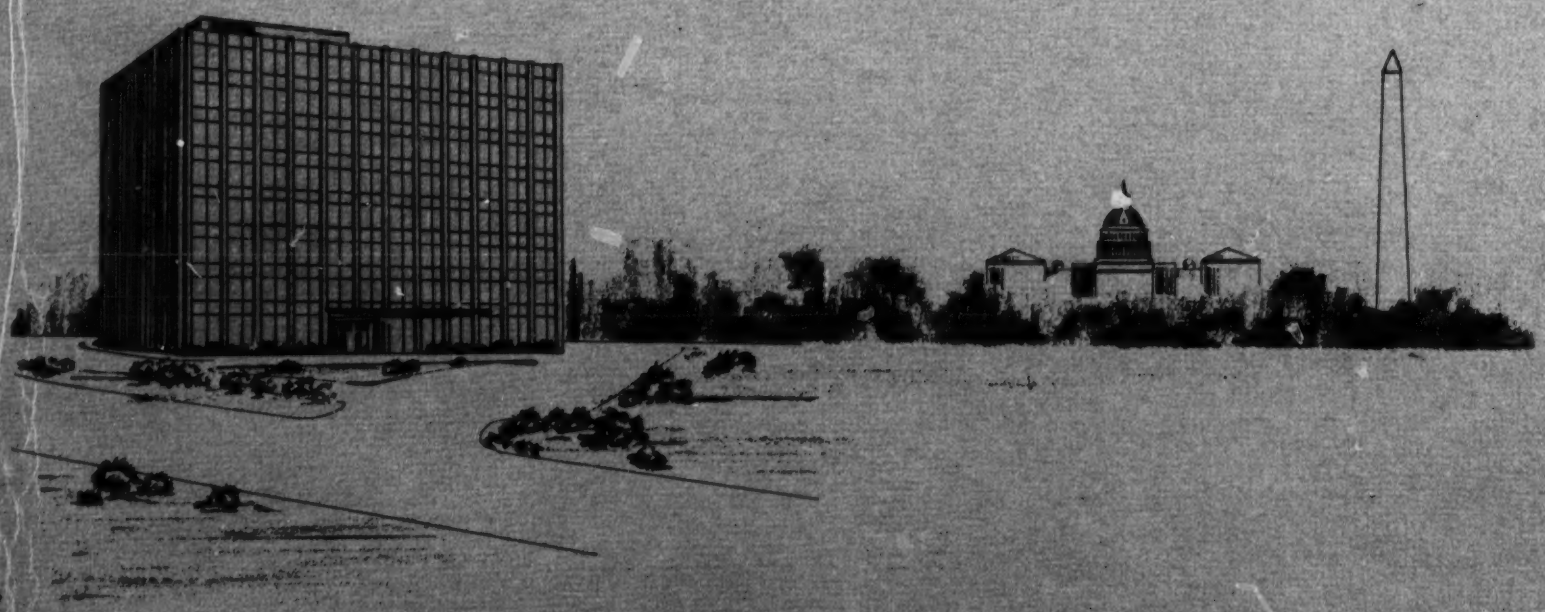
JULY 1966



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FURTHER RESEARCH ON SPEEDED SPEECH AS AN EDUCATIONAL MEDIUM --THE USE OF LISTENING AIDS

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Introduction

This progress report is one of a continuing series of reports devoted to research on variables associated with the comprehension of time-compressed speech. Compressed speech is produced by a device which permits the presentation of tape recordings in a shorter time than the recording time, without distorting the pitch. This is accomplished by the electronic deletion of very minute segments of the tape record, with the remainder of the record being abutted together.

Research has indicated that the potential use of connected discourse which is presented faster than normal, but which is just as intelligible as normal speech, is great. Concurrently, interest in compressed speech has been growing at an accelerating rate. Within the past year, the technique has received considerable publicity at professional meetings, in the press, and on television. This growing interest has taken two major directions: The application of compressed speech in situations demanding a high output of information in restricted time; and in the examination of basic problems in listening research for which this technique provides a unique means of varying the temporal aspect of speech while holding other variables essentially constant.

Previous reports of research on compressed speech at the American Institutes for Research have described a series of experiments in which college students were tested on their comprehension of connected discourse following a variety of different types of practice in listening to compressed speech. A number of different treatments have been examined in previous experiments in which the main variables have been the amount of exposure, the duration of continuous exposure, and the speed of presentation of the practice material. The major findings may be briefly summarized in the statement that the

experimental subjects had little or no difficulty in understanding compressed speech at or below 300 words per minute (wpm). Beyond that point some loss of comprehension is experienced initially, but the amount of that loss may be decreased with practice. In all cases there has been significant mean improvement at rates of 425 and 475 wpm with exposure to compressed speech as compared to a control group with very little exposure. However, at such high rates of speed, performance remained well below the level of comprehension at normal recording speed (175 wpm). (For more detailed discussion of these findings, see Progress Reports 1 and 2 in this series.)

The Listening Aid Study

In previous experiments performance has been examined under conditions which provided the listener minimal preparation for the content of the material; training was centered exclusively on exposure to appropriately speeded material. In the experiment reported here, preparation for the content of the material was employed in conjunction with practice in speed listening. In this experiment two means of preparing the subjects for the material to be presented were studied. A written summary of the material to be heard was presented to one group, while a list of key words in the passage was presented to another group. A third group (the Control group) received no listening aids prior to exposure. The major hypothesis was that relative to the performance of a control group which did not receive them, these listening aids would improve performance during training and that this improvement would generalize to performance on a new passage presented without any listening aids at the end of the experiment.

Rationale

In listening to compressed speech several factors play a major role, and it may be assumed that others play a minor role. The pri-

mary factor is the rate at which input is made to the listener. We have explored the range of speeds from 325 to 475 wpm, or, approximately two to three times the original recording speed. While practice listening has been found to improve performance, the higher the speed (in this range) the poorer comprehension is likely to be. Because there is less time to process the input, it is to the listener's advantage to recognize as quickly as possible words and phrases in the presentation. It is now well known that the fewer alternative stimuli which may be presented, the quicker will recognition response be. It was hypothesized that preparing the subject for material which may be presented will reduce the number of alternatives, thereby providing a listening advantage to the prepared subject. It was proposed, therefore, to prepare the subject in two different ways: by providing a summary of the content of the forthcoming passage without emphasizing the particular language in which it was expressed, and by preparing the subjects for unfamiliar (high information carrying) words to be heard in the passage. The performance of these two groups of subjects, at moderately high speed (375 wpm), was compared with that of a control group with no preparation.

Because of previous, primarily introspective evidence, which suggested that the best listening technique for compressed speech involved attention to larger units than one word, it was felt that the group which received the summary would have some advantage over the "key word" group.

Procedures

Subjects. The listening aid study employed 22 male college students (four freshman, nine sophomores, seven juniors, and two seniors). The subjects ranged in age from 18 to 25 years with a mean age of 19. 9 years. Eighty-six percent of the subjects had spent the majority of their lives on the East Coast, principally in and around the District

of Columbia metropolitan area. All of the subjects attended a local university with 41% in arts and sciences, 27% in business and public administration, 14% in college of engineering, and 18% in college of education. The average letter grade of the subjects for their last semester in college was C+.

None of the subjects spoke a foreign languange fluently. Ninety-one percent had never had any form of rapid reading training, the remainder having had a short high school course. None had had any rapid listening training.

The subjects estimated that they could assimilate approximately 62% of their college course work without recourse to reading about the material. Seventy-seven percent stated that they would prefer more time devoted to lecture and less to reading in their course work, while the remainder held the opposite opinion.

Subjects were paid approximately $1.50 per hour plus $1.00 carfare per session. They were told that one subject in each of the three groups would be awarded a $10 bonus based on performance.

Material. Listening materials consisted, as in previous experiments, of two kinds: Eight historical passages of about 3500 words taken from a single college level textbook on English history in the period of colonial settlement.[1] They were recorded on magnetic tape and compressed to a speed of approximately 375 wpm. For each of the passages, a five-option multiple choice test of 25-30 items was developed and standardized on a similar student population. In addition, a precis (about 170 words long) of the passage content, and a list of the key words in the passage (a mean of 128 words per passage) were also produced. The second type of material was used for listening practice and consisted of a single novel

[1] Notestein, W. The English people on the eve of colonization, 1603-1630. New York, Harper & Bros., 1954.

(Run Silent, Run Deep)[2] recorded on magnetic tape and compressed to a speed of 375 wpm.

In addition to the above materials, a biographical data sheet and a debriefing questionnaire were also used. At the end of the experiment, a battery of psychological tests selected from those developed by Project TALENT[3] was administered, and a measure of simple reaction time taken.

The equipment consisted of the following: one Tempo Regulator, one Magnecord tape recorder, one Bogen amplifier, two Eltro-Voice speakers, and ancillary wiring. A reaction timer consisting of Decade Interval Timers Model 100 C, Series D, and Model 120A KlockKounter was also employed. The experiment took place in a sound deadened laboratory in which the students were seated as in a classroom. The tape recordings were presented free field.

Design. The basic design called for an initial measure of performance at normal recording speed (175 wpm) for purposes of establishing a base line and for dividing the 24 subjects into three matched groups. Besides this initial measure, subjects also completed a biographical data sheet, a pay voucher, and were given a pure-tone audiometric screening test to ascertain whether any subjects had to be rejected on grounds of having a marked hearing loss (none were rejected). On the basis of initial normal speed comprehension scores, the 24 students were divided into three groups with equivalent mean scores. These groups were designated the Precis Group, the Key Word Group, and the Control Group. Subsequently, one subject each was lost from the Precis and Control Groups due to failure to complete the experiment for personal reasons.

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[2] Beach, E. L. New York: Holt, Rinehart & Winston, 1955.

[3] Flanagan, J. C., Dailey, J. T., Shaycroft, Marion, Gorham, W. A., Orr, D. B. & Goldberg, I. Design for a study of American youth. Boston: Houghton Mifflin, 1962.

The experiment proper was begun on a Monday and was run in seven days (exclusive of the weekend). Each session lasted approximately one and one-half hours. The first session was devoted to the initial measurements. Each of the next five sessions followed the pattern described below. Approximately 50 minutes of Run Silent, Run Deep was presented at 375 wpm, followed by a ten-minute break. After the break the Precis Group subjects were each given a typewritten summary (about 170 words in length) of the passages to follow. The Key Word Group subjects were each given a list of about 130 words consisting mostly of proper nouns and unusual words to be found in the forthcoming test passage. The remaining (Control Group) subjects were instructed to sit quietly and were given no listening aid. Subjects in the first two groups were allowed to scrutinize the listening aids for two and one-half minutes, after which the listening aid was removed and the test passage presentation begun. At the conclusion of the passage all subjects were given a multiple choice comprehension test based on information in the passage.

On the seventh day of testing, all subjects again listened to approximately 50 minutes of Run Silent, Run Deep at 375 wpm and were then given a ten-minute break. A passage and test was then presented to all subjects; however, in this case, no one received any listening aid. This was intended to measure generalization of performance to a new passage for which there was no immediately prior preparation. After this test, each of the three groups was divided into two sub-groups matched for current proficiency with compressed speech. The matching was done by combining the scores for the previous two sessions' testing as the best indicators of their abilities to date. One-half of each of the three groups was then given a precis while the other half was given nothing. The comprehension test based on the passage was then given, but no passage was presented. The purpose of this measure was to examine to what extent information in

the precis might have contributed to performance on the tests.

Subjects were then paid and thanked for their participation but were asked to return for two more sessions during which a selected group of tests taken from the Project TALENT battery of psychological tests were administered in an effort to find skills which might be highly correlated with proficiency at listening to compressed speech. For the same reason, a measure of simple reaction time was also taken. The reaction time measure was taken in the following way for 20 of the 21 subjects who took the Project TALENT battery. (One subject failed to stay for this measure.) Subjects were taken individually and told that after they hear the ready signal to watch the stationary light in the counter. After short but irregular intervals of time, that light would begin to move. As soon as the light moved, they were instructed to press the button on which their finger rested. Each subject was given five practice trials. The duration of the delay between ready signal and light movement was randomized but presented in the same sequence for all subjects. Fifteen subjects received twenty trials, the remaining five received ten trials because of lack of sufficient time. The mean duration between onset of light movement and button press was taken as the subject's reaction time.

Results

Table 1 shows the group means and the order of presentation of the passages. Percentages were compiled by using each subject's normal speed score as his own base. Performance on the base line passage presented at 175 wpm was similar to that of subjects in previous experiments. The mean score for the 22 subjects who completed the experiment was 14.3 based on a 25-item test, corrected for guessing, as compared with overall mean score of 15.1 for 102 previously tested subjects.

Table 1

Mean Listening Test Scores[a] and Mean Percentages of Normal Speed Scores by Group and Rate of Presentation in Order of Presentation

Subject Group	Word Rate Per Minute and "C" Passage Designation								
	175 C-1	375 C-7	375 C-8	375 C-6	375 C-3	375 C-2	375 C-4[b]	No Passage[c] C-5[d]	C-5[e]
Precis (N=7)	14.1	7.6	12.2	12.0	10.2	12.4	11.8	4.8	6.2
%	100.0	55.6	93.6	90.4	72.9	90.2	91.6	39.0	39.2
Key Word (N=8)	14.4	8.2	10.2	10.3	9.2	11.5	13.2	8.0	3.0
%	100.0	57.1	80.7	82.4	62.6	83.1	97.5	55.6	22.2
Control (N=7)	14.3	8.2	10.6	11.4	11.6	14.0	12.9	5.6	7.0
%	100.0	60.9	82.8	87.6	81.3	108.4	88.6	50.0	27.7
All Subjects (N=22)	14.3	8.6	11.0	11.2	10.3	12.6	12.7	6.2	5.3
%	100.0	57.7	85.4	86.6	71.8	93.4	92.8	48.0	28.8

[a] Scores were prorated to a base of 25 items and corrected for guessing.

[b] This passage and test was administered to all subjects without any listening aids.

[c] Approximately one-half of each group is represented in each column.

[d] All subjects in this column received a precis prior to the test.

[e] No subjects in this column received any listening aids prior to this test.

The differences in means between the three groups on the five days during which listening aids were presented were small, and not statistically significant, according to a two-factor analysis of variance; contrary to the predictions made. Table 2 presents the summary ANOVA.

Table 2 shows that, while the groups do not differ from each other, there was a significant tendency to improve with practice (p is less than .01). For each of the groups the best mean score was achieved on the last of the five tests, the poorest mean score on the first. The combined means were: 8.6, 11.0, 11.2, 10.3, and 12.6, respectively for the five practice tests in order across time.

On the seventh day of the experiment, the test passage was administered at the same point in the session except that none of the subjects received any listening aid. Again, no significant difference among the group means obtained. The respective means scores for the Control, Precis, and Key Word Groups on this test were: 12.9, 11.8, and 13.2 with a combined mean of 12.7. These may be compared with the base line scores at normal speed for the three groups, which were: 14.3, 14.1, and 14.4, respectively, with a combined mean of 14.3. Although the final test (at 375 wpm) scores were lower than the initial test scores at normal speed, the difference did not reach significance at the .05 level.

The final test of the experiment, also administered on the seventh day, consisted of the presentation of a precis to one-half of the subjects in each group, with no listening aid supplied to the remaining half. This procedure was designed to see if the precis provided a significant impact on the number of questions answerable without recourse to the passage. Therefore, no passage was presented. The mean score on this test for the combined one-half of the subjects who received the

Table 2

Summary ANOVA Groups by Five Tests

During Listening Practice

Source of Variation	df	Mean Square	F
Between Ss	21		
Groups	2	1.47	
Within	19	28.91	
Within Ss	88		
Tests	4	61.71	6.46**
Groups x Tests	8	4.43	
Tests x Within Ss	76	9.55	

**p < .01

precis was 6.2, while that for the other half was 5.3, a non-significant difference. This finding suggests that the information provided in the precis was non-specific enough that it did not bias the score obtained by the Precis Group by providing them answers to the questions independent of listening to the passage.

In examining the significant improvement of the subjects with practice, the scores may be looked at in relation to the normal speed listening scores. There was a strong tendency to show improvement with successive sessions. The mean percentages of normal speed performance from the second through the sixth day were as follows: 57.7, 85.4, 86.6, 71.8, and 93.4. Performance on the final passage at 375 wpm administered on the seventh day was 92.8% of normal speed score. Figure 1 shows these data.

These results compare favorably with any achieved in previous experimentation at that speed. Table 3 shows the percentages of normal speed score achieved by previous subjects on the last new passage administered at 375 wpm. Performance of the subjects in the present experiment ranged from 9 to 22 percent better than that of previous groups at this speed. This was achieved with less listening practice than any previous experimental group.

The current experiment combined certain features of previous experiments which may have led to this advantage: Sessions were approximately one and one-half hours in length; they were held daily, the proportion of time devoted to listening to test material as opposed to practice material was greater than for previous experimental groups; and the duration of constant listening was approximately 50 minutes without interruption. The material was all presented at one speed (375 wpm), intermediate between normal (175 wpm) and high speed (475 wpm).

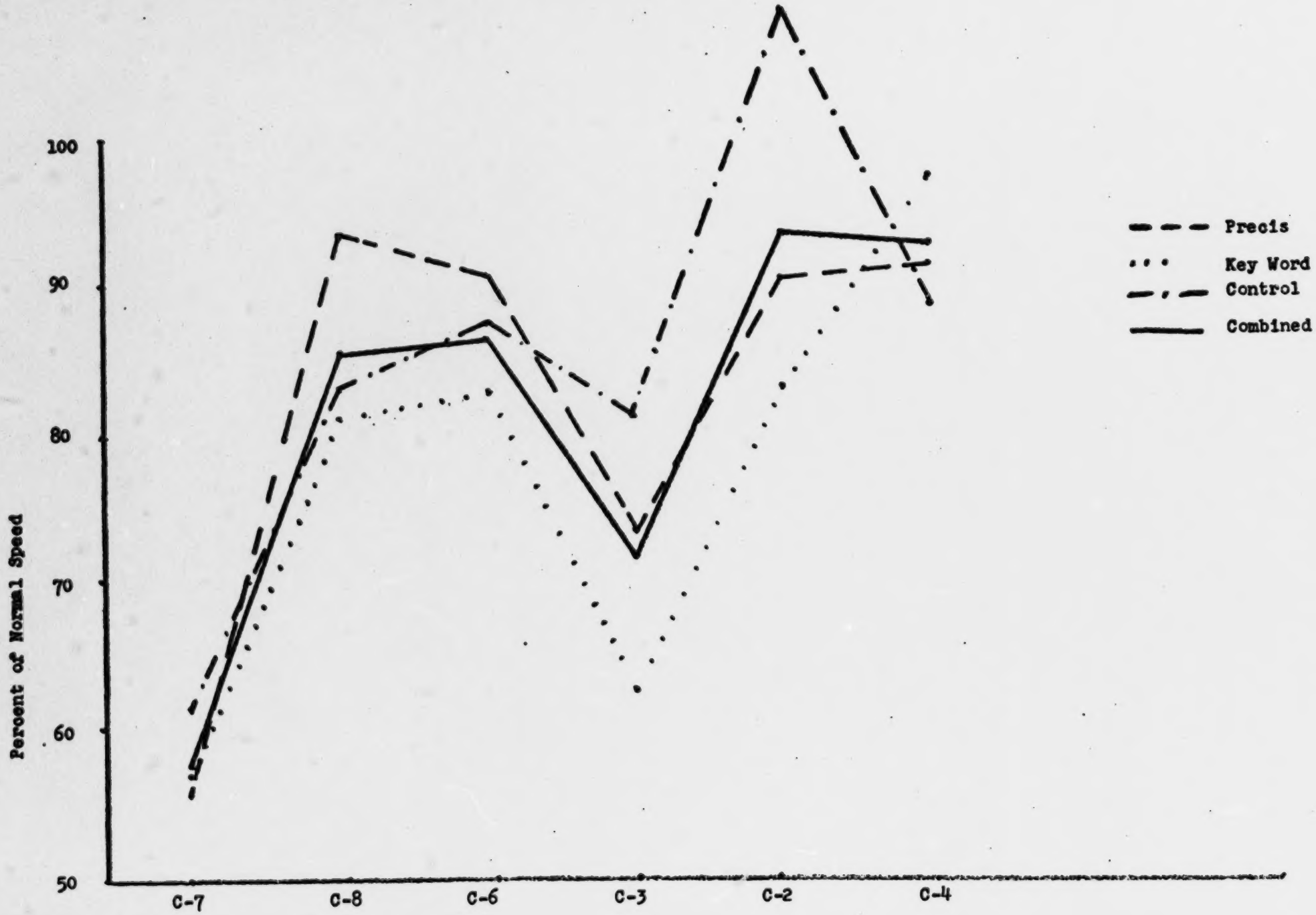

Fig. 1 Mean percentages of normal speed comprehension for five passages with listening aids and one without (C-4).

Table 3

Comparison of Comprehension Results at 375 Words Per Minute as a Function of Practice for Seven Groups of Subjects

Group	Mean Scores			Hours Listening Practice Prior to 375wpm test	
	175 wpm (Normal)	375 wpm	% Normal	Novels	Passages
Control (N=11)	17.4	12.7	71.7	0.00	0.50
Graduated Practice (N=10)	15.7	13.2	83.6	9.00	0.50
Interrupted Practice (N=11 Males)	14.1	9.4	71.0	9.00	0.50
Interrupted Practice (N=15 Females)	13.9	10.1	75.1	9.00	0.50
High Speed Practice (N=12)	13.8	9.9	76.0	9.00	0.50
Criterion Study (N=10)	15.5	11.9	77.2	15.25	0.75
Present Study (N=22)	14.3	12.7	92.8	5.00	0.75

Comprehension of Compressed Speech as a Function of Other Skills. From time to time questions have arisen as to the charac eristics of students who do well in compressed speech studies. While the present experiment was not specificually designed to answer this question, it was decided to collect data which may be relevant in this respect. To this end a battery of information and aptitude tests was administered to the subjects. The results were analyzed in two ways: by computing correlations between the test scores and listening comprehension scores; and by plotting mean test scores as a function of high, medium, and low listening comprehension scores.

Correlation Data. These data are shown in Table 4. Correlations were computed between tests in the battery and:

(1) initial, normal speed comprehension score;

(2) initial, fast (375 wpm) comprehension score;

(3) final (after five days of practice) fast (375 wpm) comprehension score.

Means and standard deviations are also presented for the test battery data.

It is clear from these data that the degree of relationship between listening test performance and the aptitude and information test scores was generally rather low. The highest relationship (social studies information vs. initial fast speed) may be explainable in terms of the fact that the test passages were based on historical material, thus perhaps giving some initial advantage to persons versed in the social studies area.

In general, however, those seven correlations reaching a significant level with normal speed listening suggest that the successful listener was bright, well-informed, and able to discern the way that

Table 4

Correlations and Summary Data for Project TALENT Tests Versus Selected Listening Comprehension Scores (N=22)

Test	Passage and Word Rate				
	Normal 175	First 375	Last 375	$\bar{X}$	s
Information Tests					
Vocabulary	.37	.29	.63	18.7	1.24
Literature	.49	.44	.47	19.2	1.74
Music	.30	.32	.01	9.2	2.36
Social Studies	.50	.71	.36	20.4	3.28
Mathematics	.32	.21	.17	19.5	3.42
Physical Science	.20	.27	-.08	14.7	3.32
Biol. Science	.50	.60	.13	7.9	1.67
Scientific Att.	.20	.04	.04	8.5	1.44
Aero. & Space	.54	.14	-.12	8.6	1.69
Elec. & Elec.	.56	.28	.08	14.9	3.62
Mechanics	.24	.01	.07	15.7	2.35
Farm & Ranch	.20	.06	.19	8.9	1.32
Home Economics	.11	.21	.30	10.3	3.46
Sports	-.17	-.13	.00	11.1	2.19
Total Score	.34	.44	.25	199.3	20.86
Aptitude Tests					
Arith. Comput.	.42	.12	.26	43.5	11.06
Mem. Words	.00	-.28	.16	15.0	6.22
Mem. Sentences	.07	-.43	.25	10.3	2.11
Math. I	.21	.15	.04	14.0	2.04
English Usage	.13	.02	.20	19.4	1.86
English Expression	.10	.04	.44	10.6	1.07
Abstract Reason.	.37	.12	.00	11.3	1.88
Mech. Reason.	.08	-.07	.15	16.6	2.78
Disguised Words	.03	.31	.02	22.1	5.66
Vision 3-D	-.04	.09	.20	10.7	3.66
Word Function	.49	-.04	.21	16.5	4.24
Reaction Time	-.18	.09	-.06	.185	.036

p_{05}: r = .42

words function in sentences. The five relationships with initial high speed score give a somewhat similar impression; however, the significant negative relationship with memory for sentences suggests that, at least at initial confrontation with compressed speech, focus of attention on grammatical entities such as sentences is associated with poorer comprehension.

At the final stage there were only three significant correlations with listening score: vocabulary, literature information, and English expression. Thus after practice, success in comprehending rapid speech appears to be clearly associated only with a language ability factor, thereby suggesting that, when the task of listening is difficult, but the listener is skilled, general language abilities are the most crucial.

Mean Plots. To gain further understanding of the relationship of the listening comprehension scores, the data were plotted as follows: The total group of subjects (N=21) was divided into approximate thirds on the basis of the listening comprehension score; the mean Project TALENT test score was computed for each third (high, medium, and low); these means were referred to Project TALENT data[4] for 12th grade males; differences from the Project TALENT means in terms of Project TALENT standards deviation units were plotted by high, medium, and low groups for each Project TALENT test. This procedure was employed for thirds based on initial (normal speed) score, initial high speed score, and final high speed score. The data are shown in Figures 2, 3, 4, 5, 6, and 7.

These plots, being based on very small groups of subjects (6-9 each), provide tentative descriptive data and are included here

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[4]Flanagan, J. C., et al. The American high school student. Pittsburgh: University of Pittsburgh, 1964, Pp. 2-47, 48.

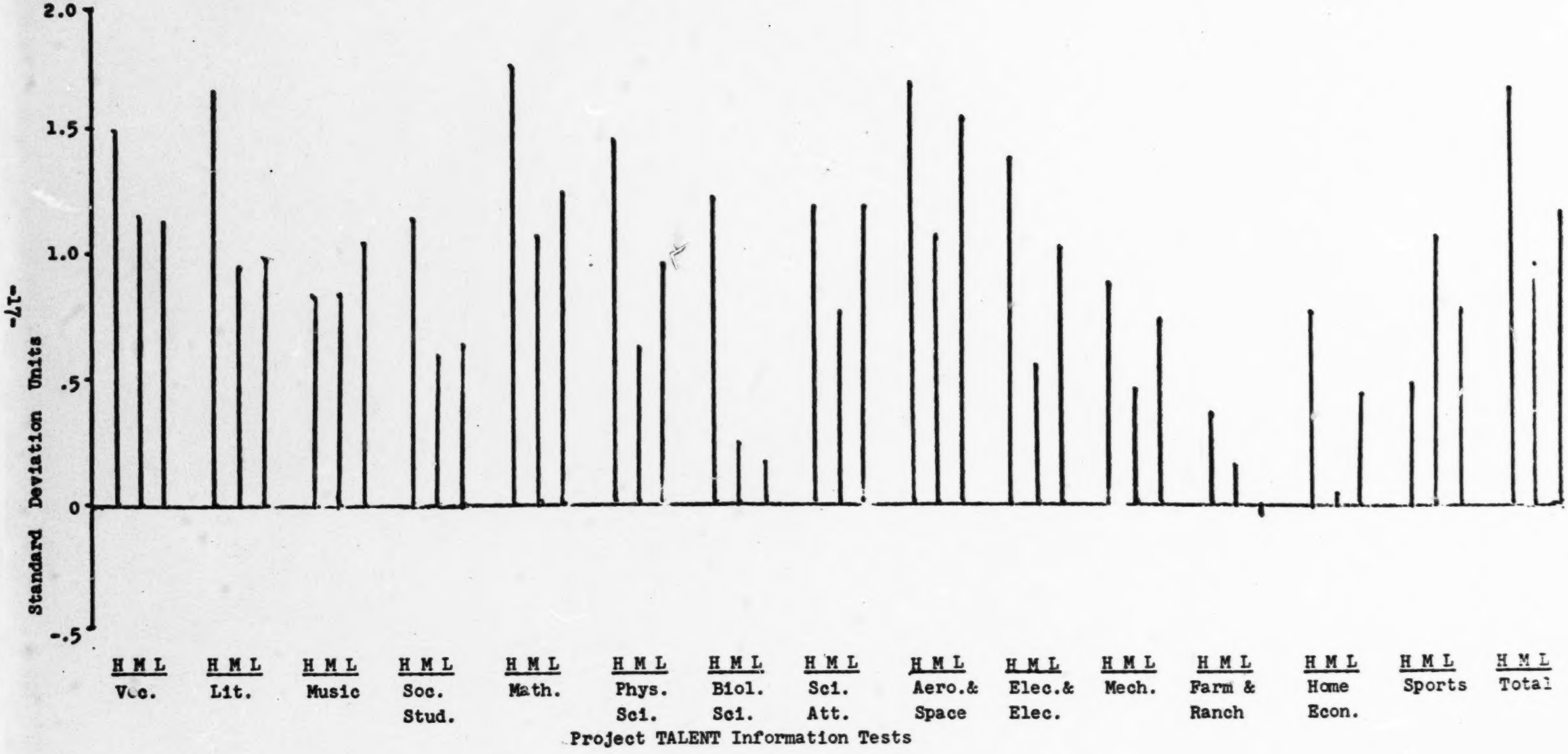

Fig. 2 Comparison of means for High, Middle, and Low thirds on the initial, normal-speed listening comprehension test (C-1) in terms of Project TALENT information means and standard deviation units.

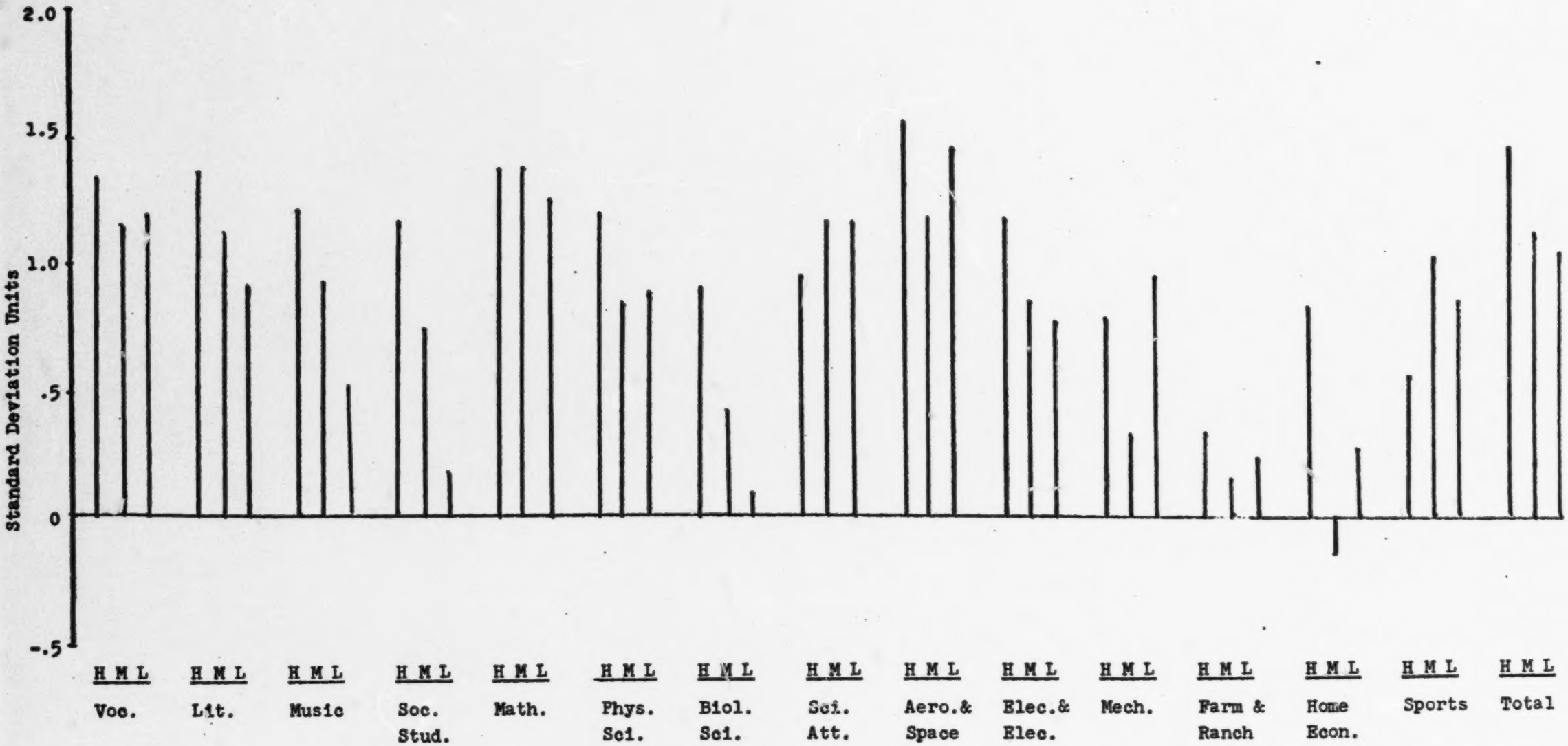

Fig. 3 Comparison of means for High, Middle, and Low thirds on the initial 375 wpm listening comprehension test (C-7) in terms of Project TALENT information means and standard deviation units.

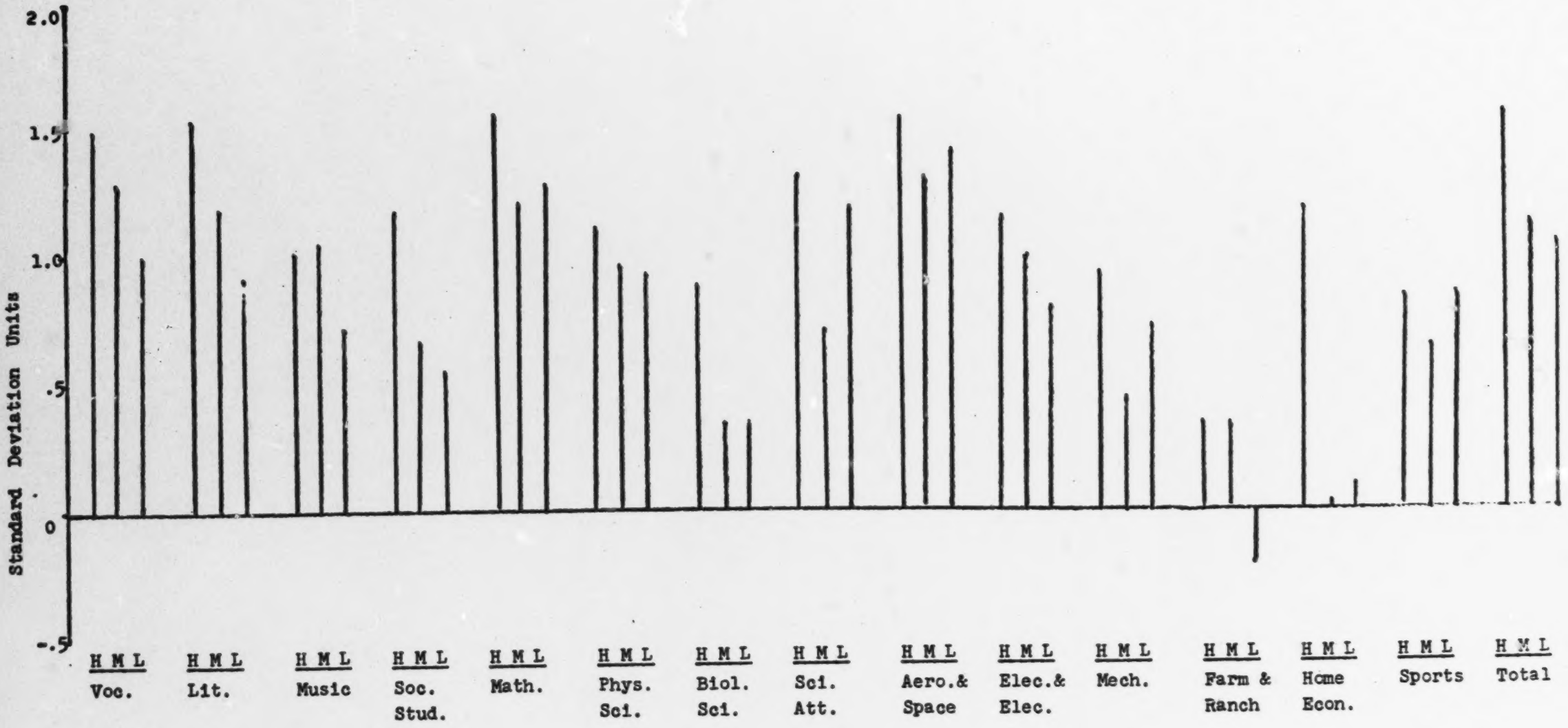

Fig. 4 Comparison of means for High, Middle, and Low thirds on final 375 wpm listening comprehension test (C-4) in terms of Project TALENT information means and standard deviation units.

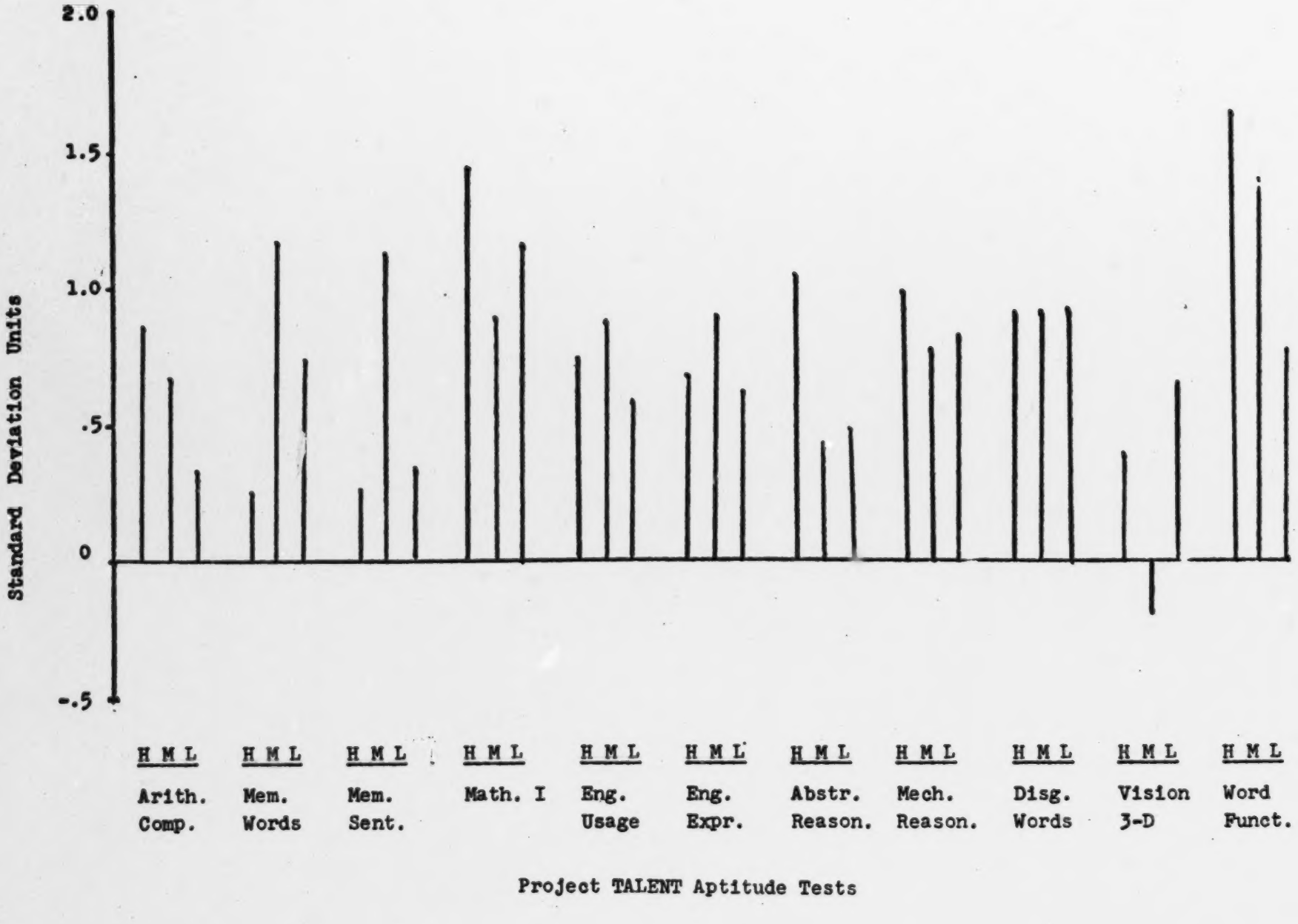

Fig. 5 Comparison of means of High, Middle, and Low thirds of initial, normal speed listening comprehension test (C-1) in terms of Project TALENT aptitude means and standard deviation units.

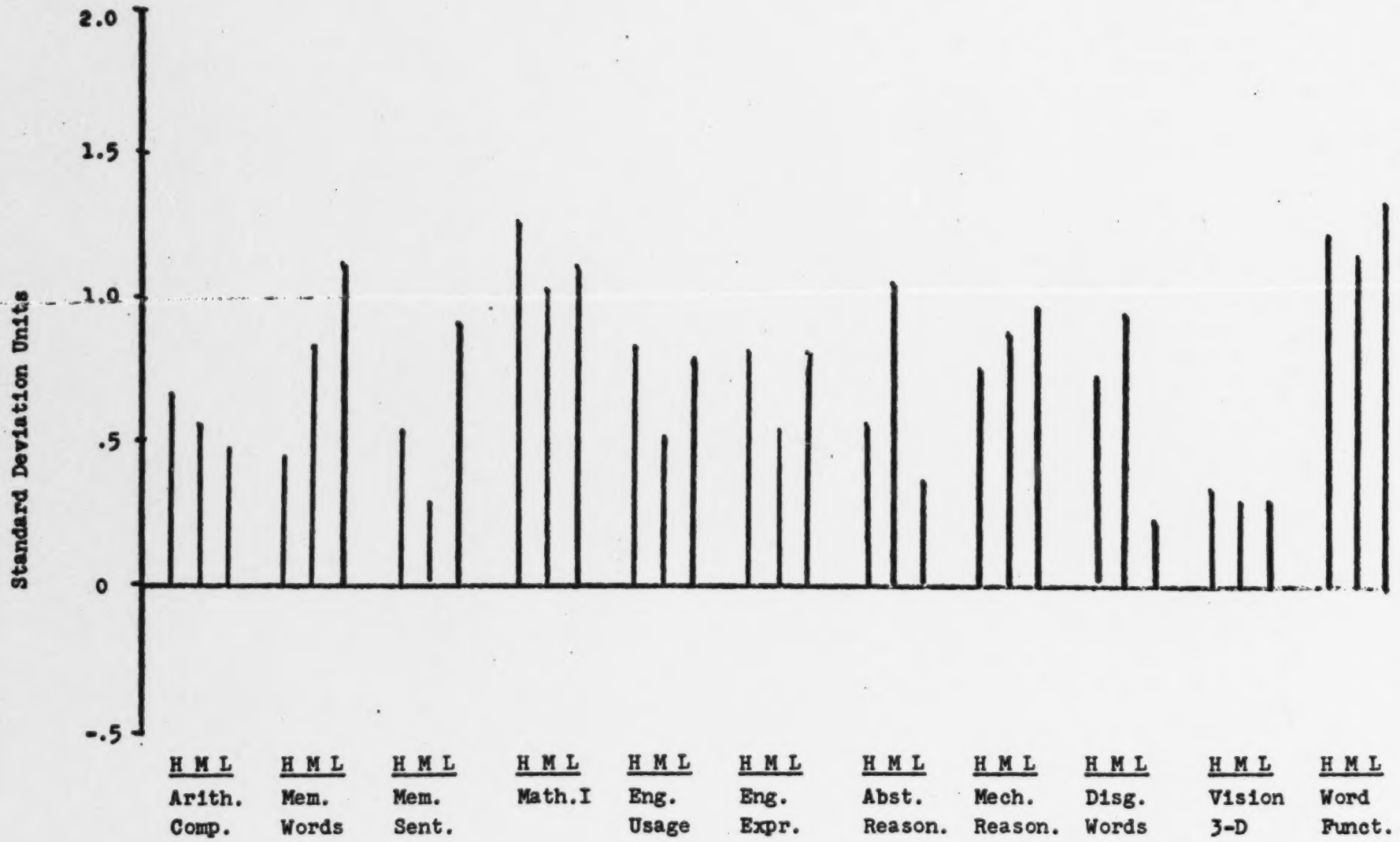

Fig. 6 Comparison of means of High, Middle, and Low thirds of initial 375 wpm listening comprehension test (C-7) in terms of Project TALENT aptitude means and standard deviation units.

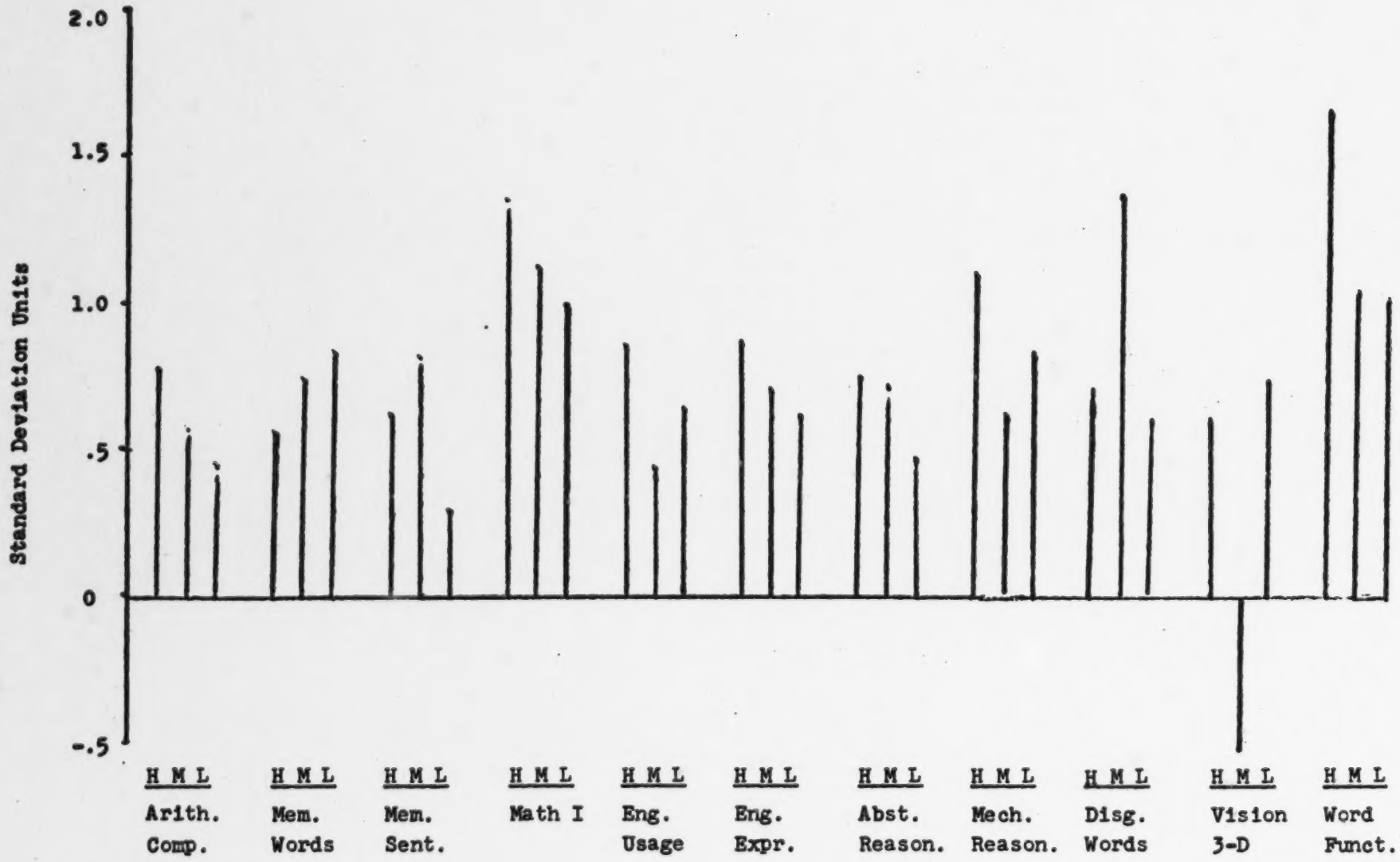

Fig. 7 Comparison of means of High, Middle, and Low thirds on final 375 wpm listening comprehension test (C-4) in terms of Project TALENT aptitude means and standard deviation units.

only for general interest. A few observations may be made about them, however.

With respect to the information tests there was a clear tendency for the normal speed high group to be highest on the Project TALENT tests. Differences among H, M, and L groups tended to be reduced at the initial high speed stage though Music, Social Studies, Biological Sciences, and Home Economics information still clearly separated the groups. At the final high speed stage, the H group was distinguished primarily on Social Studies, Biological Sciences, Home Ecnomics, and Total Information scores. The relative positions of H, M, and L groups fluctuated from stage to stage, often as a result of fluctuation of the position of the M group.

With respect to the aptitude tests, the normal speed high group clearly excelled only with respect to Math; and, in several cases, notably Memory for Sentences and Words, the M group surpassed both H and L groups. At the initial high speed stage the H group again was not clearly outstanding, the M group was highest in Abstract Reasoning, and the L group was highest on the two memory tasks. At the final high speed stage, the H group is characterized by high performance on Mechanical Reasoning and discovering Word Functions in sentences, while the M group stands out with respect to identifying Disguised Words.

In summary, it should again be noted that these data are only suggestive and not definitive. It appears that good listeners were characterized, not surprisingly, by a higher intellective informational capability. Though there were no differences at normal speed, the better listeners at initial high speed tended to be those who excelled at deciphering a message (Disguised Words). After practice (final high speed) the best listeners excelled at detecting Word Functions in Sentences while the second best listeners remained those high on the Disguised

Words task. In this the best listeners resembled the normal speed condition where Word Functions also characterized the better listeners. Specific memory factors seemed to be inversely related to listening score particularly at the first high speed stage, suggesting that excessive attention to detail is possibly antithetical to good listening performance. In general, however, the results supported the findings from the correlations that those skilled in dealing with language (particularly functionally) tended to be the better listeners.

Debriefing Questionnaire. At the end of the experiment proper, the subjects were given a form to complete which called for their evaluation of the experiment and their roles in it. All subjects responded yes to the questions concernirg whether or not their abilities to comprehend speeded speech had improved during the experiment and whether or not practice had helped them.

The Precis Group for the most part felt that the summary presented just before each passage helped them listen to the passage by giving them some idea of what to look for. The Key Word Group, on the other hand, had a somewhat negative attitude toward their listening aid. It was generally felt that the key word list encouraged a tendency to listen for specific words at the expense of overall meaning. There was some feeling, however, that the key words provided clues in answering the questions.

The Control Group was asked what techniques of their own they had devised, if any, to improve their abilities to comprehend compressed speech. Five subjects mentioned that they tried to concentrate and comprehend the subject as a whole rather than to dwell on specific items.

In discussing changes that might be desirable, factors of comfort such as better air-conditioning, more comfortable seats, etc., were mentioned. Most subjects felt that concentration was of vital importance and any distraction a hindrance.

The prevalent initial reaction to compressed speech was discomfort at the speed. However, as in previous experiments, a favorable impression soon developed, together with the feeling that the speed was comfortable or would be by the end of the experiment.

Most subjects indiated that their attention did wander at certain times but there seemed to be no systematic explanation for it. In response to the question: "Would you be willing to participate in another experiment?" all 22 subjects responded "yes."

Summary and Discussion

This experiment was designed as a test of the hypothesis that listening aids presented during training would improve performance on compressed speech listening tests. The listening aids consisted of a summary of the material to be heard, presented to one group, and a list of key words in the material to be heard, presented to a second group. A third group acted as a control with no listening aids presented. Two conclusions may be drawn: The listening aids did not significantly affect performance; all groups improved with practice in their ability to listen to compressed speech at 375 wpm. (It should be remembered that the "control" group in this experiment received exactly the same amount of listening practice as the other groups.) The improvement with practice led to a final mean score at 375 wpm which averaged better than 90% of normal speed score and was not statistically different from normal speed score.

The examination of the relationship of listening performance to other aptitude and informational scores suggested that good listeners tend to be generally able and well informed, but that at higher speeds general language ability is increasingly important. The evidence also suggested a tentative hypothesis that good performance at higher speed is associated with listening for meaning rather than concentration on

specific words and details.

In general the results reconfirmed previous experimental findings that good comprehension is possible at high speeds and that very modest amounts of practice are efficacious in improving comprehension of compressed speech. The failure of the listening aids to improve performance may possibly be attributable to their focusing attention on aspects of the passage which were irrelevant with respect to the test questions. (It should be noted that the listening aids were carefully designed not to tip off answers to the questions.) In addition to this, they may also have functioned to focus attention more on detail than understanding, thus reducing their effectiveness in accordance with the hypothesis discussed above. Finally, it may be that the overriding factor in learning to comprehend speeded speech is simply developing familiarity with the initially somewhat strange sounds of which it is comprised. (However, the trend in comparing the listening aids means to the control mean does not tend to support such an interpretation.)

In subsequent research it is planned to examine the question of listening aids further. A new experiment is planned in which a mechanical listening aid (a tone superimposed on the tape to call attention to important points) and a modified precis procedure will be compared to a new control group. In this experiment, both listening aids will be designed to call attention to portions of the passage important to answering the test questions (a procedure similar to that employed in actual classroom practice). Specific answers to the questions will not be provided in this fashion, however.

Experimental examination of other methods of improving the comprehension of time-compressed speech is also planned for the future. The present experiment added further weight to the conclusion

that practice sessions should be frequent (daily) and of substantial duration (about one hour) without interruption. Such a practice schedule will be retained in the future, but the effectiveness of making the practice material more similar in content to the test material will be examined. An experiment will be run to find out how the student adjusts the speed of presentation to suit himself as a function of practice. The combination of visual presentations with the auditory presentation will also be examined as a method for improving comprehension of time-compressed speech.

The overall results of the studies conducted to date have been highly encouraging with regard to the potential educational vale of compressed speech. It is hoped that this research will spur efforts toward a greater understanding of the complexities not only of compressed speech listening, but of the listening process in general.